DLP/DOC DIV
US ARMY ARMOR SCHOOL
CPT Gordon/4-1848
16 May 1972

# EVALUATION OF CREW DUTIES AND FUNCTIONS TO DETERMINE THE OPTIMUM CREW SIZE FOR SUSTAINED MAIN BATTLE TANK OPERATIONS

1. PROBLEM. To determine, through an evaluation of crew duties and functions, the optimum crew size for sustained main battle tank operations. While the crew size considerations discussed herein develop rationale supporting crew stations for operation of the total weapons system, they are not associated with a specific tank design. The allocation of the important crew tasks in the determination of the crew size requires answers to these questions:

--What is the role of the commander in each of the varied missions that may be assigned?

--How will the role of the commander be affected if another crew member is injured?

--To what extent should the commander be a fighting member of the crew compared with the necessity of coordinating the tank's role from individual tank to section and platoon?

--What part, other than loading, does the loader play that makes him critical to the crew?

--To what degree is tank crew effectiveness reduced if crew members become incapacitated or seriously fatigued?

2. ASSUMPTIONS.

a. Optimum crew size can be determined without regard to a specific weapons system.

b. The new MBT will be comparable in crew level maintenance with the current medium tank.

c. The tank crew can operate its tank when its members are in good physical condition.

d. Crew tasks will be appropriately distributed among the crew members based on skill level, training, and job description.

e. Periods of extended activity will require tank crews to operate continuously, with resulting sleep loss, for periods in excess of 48 hours.

f. Armor operations will continue to be characterized by periods of extended activity.

g. A tank crew's effectiveness can be no greater than that of its members.

3. FACTS BEARING ON THE PROBLEM.

a. The primary functions of commanding, firing, driving, and loading must be performed by personnel, by vehicle automatic components, or by any possible combination of both.

b. Certain additional crew duties must be performed. Among these are maintenance, resupply, security, and target acquisition.

c. The time and effort required of each crew member in the performance of assigned primary functions and additional duties is inversely proportional to the size of the crew.

d. The state-of-the-art exists to automate the manual function of loading the tank's main gun.

e. The failure of a tank crew to satisfactorily perform any one of its assigned crew duties and functions may result in the incapacitation of the entire weapons system.

4. DISCUSSION.

a. The combat capabilities of tank crews are the most important aspects in evaluating the crew duties and functions to determine the optimum crew size. During combat operations, the crew is required to perform all of the primary functions of operation of the total weapons system and all of the additional tasks of sustaining that operation. Many in both categories are performed simultaneously. To achieve success and survival on the battlefield, they all must be performed in the most expeditious and satisfactory manner. The tank crew must be of sufficient size to insure appropriate distribution of required tasks. Figure 1 depicts the functions of crew members.

## CREW FUNCTIONS

1. Commander

A. Commands the tank and supervises and controls other members of the crew.

B. Trains crew.

C. Directs overall maintenance of the vehicle to include determining maintenance responsibilities.

D. Acquires targets.

E. Determines which targets to engage, and how each target should be engaged.

F. Monitors supply status of ammunition, POL, and repair parts. Requests resupply as necessary.

G. Gathers intelligence information.

H. Calls for and adjusts supporting fires.

I. Integrates action of his tank into the activities of the section and platoon.

J. Selects the route for the tank to travel in all missions.

K. Operates fire control equipment as required.

L. Supervises counterintelligence measures.

M. Communicates within his tank, and between his tank and other elements of the platoon.

N. Performs security as required.

O. Loads and fires cupola mounted secondary armament.

2. Gunner

A. Aims and fires main gun and coaxially mounted secondary armament.

B. Assists in target acquisition.

C. Maintains designated fire controls, and traverse and elevating systems.

FIGURE 1

D. Indexes designated ammunition information into fire control system.

E. Assists in performing security.

F. Aims searchlight.

G. Acts as a replacement for other crew members as required.

H. Assists in performing automotive maintenance tasks as required.

3. Driver

A. Drives vehicle.

B. Performs organizational maintenance on automotive components.

C. Assists in performing security.

D. Assists in target acquisition.

E. Operates ancillary equipment as required.

F. Refuels vehicle as required.

4. Loader

A. Loads main gun.

B. Loads and clears stoppages in coaxially mounted secondary armament.

C. Loads main gun and coax ammunition on vehicle.

D. Assists in target acquisition.

E. Operates ancillary equipment as required.

F. Maintains main gun.

G. Maintains coax (to include change of barrels).

H. Provides air guard, local security at halts, and acquires low-flying aircraft targets.

I. Acts as a replacement for other crew members as required.

J. Maintains all radio communications equipment aboard the tank.

K. Maintains fighting compartment and stowage, including ammunition, within the fighting compartment.

L. Assists in performing automotive and turret maintenance tasks as required.

Figure 1 (Continued)

This figure relates to the conventional four-man crew; however, these duties must be reallocated if a member of the crew becomes incapacitated. If automatic vehicular components replace a crew member and assume the role of performing one or more of that member's functions, the remainder must also be reallocated to other crew members.

b. The additional tasks required for sustaining the operation of the total weapons system are grouped for evaluation into four primary categories: maintenance, resupply, security, and target acquisition.

(1) Maintenance. Vehicle subsystem maintenance is critical to sustained operations.

(a) Additional systems usually result in maintenance tasks becoming more demanding. The development of sophisticated equipment which accomplishes loader duties may replace some of the manual functions accomplished by the loader during actual combat operations, but it appears unrealistic to assume that the related maintenance and resupply duties routinely performed by the loader could be easily accomplished by other crew members. Maintenance requirements may be minimized but not to the extent that loader maintenance duties can be eliminated.

(b) Operational experience indicates that the tanks currently in the inventory require a minimum of 30 minutes before operation and 2-1/2 hours after operation maintenance checks daily, assuming that no major maintenance problems are encountered. This experience relates to a tank with a four-man crew, all of whom participate in maintenance related duties. A reduction of crew size complicates this time-consuming and demanding requirement to the point that crew fatigue causes routine deferral of required maintenance activities.

(c) In the sustained combat environment, the entire crew is occupied in preparation for continued operation. Maintenance of automotive, communication ordnance, and ancillary equipment is worthy of extensive consideration in development of crew size. Without sufficient personnel to adequately accomplish these routine requirements, the vehicle, regardless of its sophisticated systems, will eventually reach a nonoperational condition.

(d) Emergency crew maintenance and recovery requirements frequently exist on full-tracked vehicle. A crew of less than four men, regardless of the number authorized, does not appear adequate to solve many of these problems without additional support from other agencies. The routine task of replacing a thrown track, for example, is very difficult for less than four men. It appears, therefore, that the emergency maintenance downtime increases as the crew size decreases not withstanding the increased sophistication of the vehicle.

(e) Similarly, it appears that periodic services would require additional man-hours. This conclusion is based upon:

1. An assumed increase in the complexities of the equipment with resultant increases in the number of component inspections and services.

2. A reduction in crew size reducing the assistance that the crew can contribute to the scheduled maintenance effort.

(2) Resupply. The importance of resupply is directly proportional to the length of a sustained operation. The primary commodities requiring the efforts of the tank crew in their resupply effort are POL and ammunition. While refueling operations involve only two of the tank crew members, the requirement for crew control, coordination with other elements, and security continue. The uncrating, loading, and stowing of main gun ammunition is a major task for the unassisted tank crew. As in refueling, resupply of ammunition requires the simultaneous performance of security and coordination. The absence or incapacitation of one crew member of a small tank crew during these resupply efforts could incapacitate a total vehicle and perhaps delay an entire unit. Twenty-five percent more time is required for three men to reload a tank than four men, assuming none are performing any other tasks. A two or three-man crew cannot be considered self-sufficient during these critical periods.

(3) Security.

(a) Security is particularly important to the tank crew. The tank crew cannot rely upon other elements to provide its local security on a continuing 24-hour basis. It must have an inherent capability to provide an air guard and limited local security at halts. A limited reconnaissance capability for checking trafficability and for possible obstacles, without degrading the vehicle's firepower capability or coordination responsibilities, is also essential. Figure 2 depicts such a dismounted crew member. The lack of adequate personnel to accomplish these dismounted tasks on an immediate, continuing basis depreciates the tank's chances for survivability in a combat environment. Security requirements are many times overlooked during periods of crew fatigue. Since crew fatigue increases faster in the smaller crew, its indirect effect upon the smaller crew configuration degrades security to an unacceptable level.

(b) Security requirements in tank units are not restricted to the single tank. Platoons and companies experience a continuing requirement in all missions for providing their own security. In many instances, infantry and mechanized infantry are cross-attached on a mission basis. These elements are task organized with tanks for the accomplishment of team and task force assigned missions and not solely for the purpose of providing security to the tank unit. When engaged in independent operations, security becomes a critical inherent mission for the tank unit and its tank crews. Current sized and smaller crews are seriously constrained to provide their own security.

Crew Member Dismounted For Security Purposes

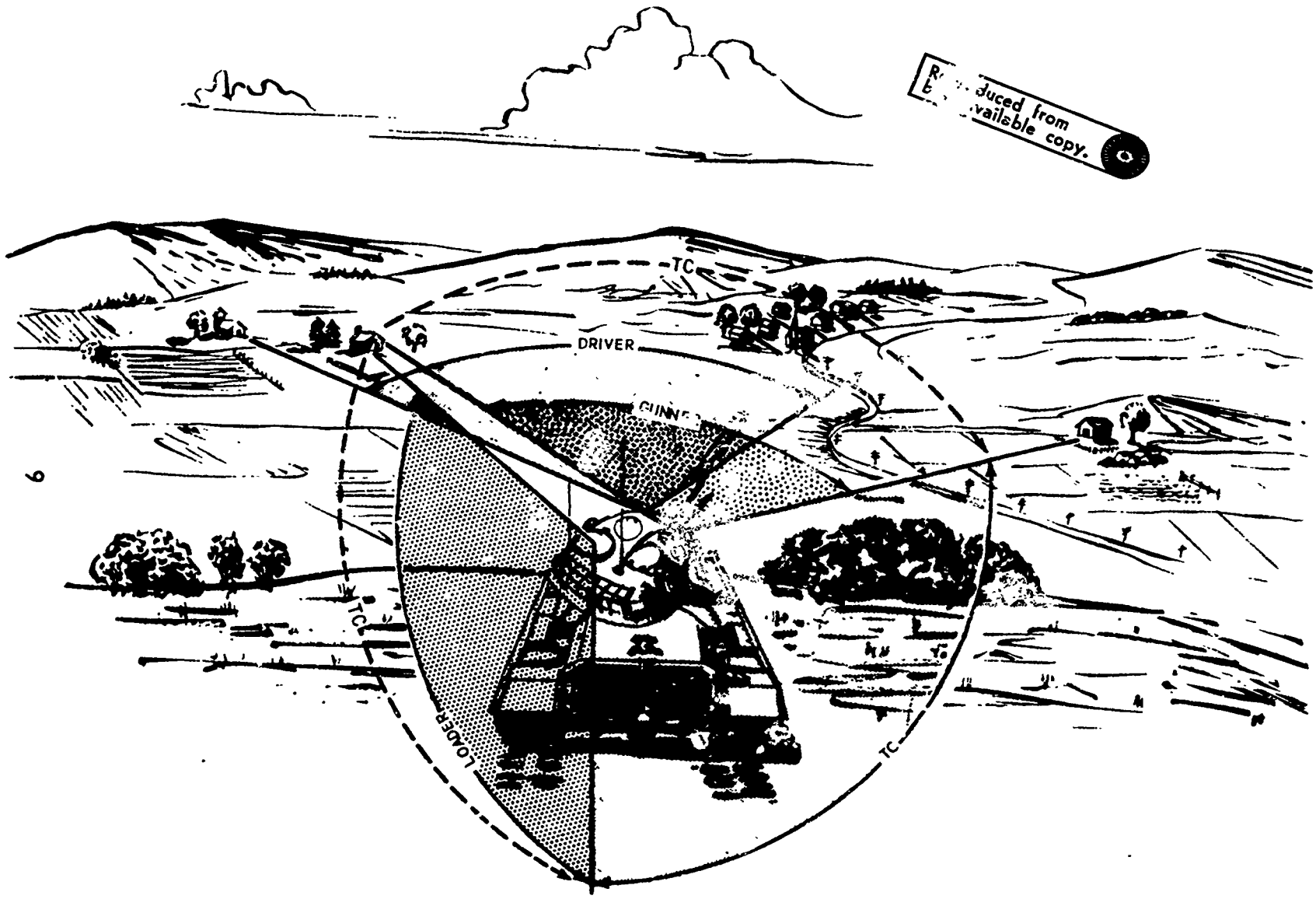
Figure 2

A larger crew or a separate organization should be adopted to meet this requirement. It is considered that, as a minimum, such a separate organization in a tank company equipped with four-man tanks be the equivalent size of one rifle squad with appropriate supervision and an organic means of mobility. These personnel should be trained as armor crewmen in order that they be knowledgeable in the security problems peculiar to tank units. Such qualification also provides the tank unit commander with personnel as a source of immediate replacements, for assistance in resupply or in the security of resupply operations, and for assistance in emergency maintenance and recovery efforts. This organization would be a significant contribution toward sustaining main battle tank operations over extended periods. The five-man crew configuration provides seventeen additional armor crewmen to the tank company and its adoption would preclude the necessity for such a separate organization.

(4) Target Acquisition. While target acquisition is generally considered a function supporting the firing of tank mounted weapons, it is considered herein in the broader context as a total crew requirement for tank success and survivability. It is a function requiring the efforts of all of the crew and not simply those engaged in a weapons subsystem's employment. Figure 3 depicts the crew sectors of observation for a four-man tank crew. In this configuration the loader is responsible for a sector comprising one-third of the area surrounding the tank. This figure does not depict the area of responsibility given to the loader for acquiring low-flying aircraft targets. Many times a crew member must also be dismounted for proper target acquisition, damage assessment, or assistance in adjustment of fires. Adequate personnel must be provided within the tank crew to accomplish these tasks.

c. In response to the five questions included in the problem statement, a brief discussion-type answer based on the preceding rationale, will follow a restatement of each question.

(1) What is the role of the commander in each of the varied missions that may be assigned? ANSWER: The tank commander controls the actions of the crew in any given mission. The enlisted tank commander is a sergeant who normally has several years of experience on tanks and is usually qualified as gunner, driver or both. The commissioned officer tank commander is the leader of the platoon as well as the commander of one tank. Platoon command duties often require the platoon leader and/or the platoon sergeant to be away from his command vehicle. This situation leaves the remaining three men of the four-man crew to perform all necessary duties and rest in turn. In a smaller crew, the absence of one man would create a situation where little or no time would be allowed for crew rest on command vehicles.




Crew sectors of observation.

**Figure 3**

(2) How will the role of the commander be affected if another crew member is injured? ANSWER: The role of the tank commander if one man is lost will be dependent upon how he shifts the crew to meet this problem. If the gunner is moved to the loader's or driver's position, the commander will be forced to aim and fire the weapons. This arrangement will lessen the firepower of the vehicle and hinder coordination of the tank within the platoon. The tank commander may elect to load the weapons himself. This method will also affect control and volume of fire but would retain the accuracy of the weapons. In either case, the tank commander has the flexibility to base his decision upon the tactical situation. The loss or incapacitation of one of the crewmen on a command tank requires an immediate move of a crewman from another tank unless a highly skilled replacement is immediately available. In a three-man crew, the effect of the loss of one man is a fifty percent workload increase over that experienced by the four-man crew. The loss of a man on a command tank having a three-man crew will seriously degrade the effectiveness of that key vehicle and perhaps the entire unit's.

(3) To what extent should the commander be a fighting member of the crew compared with the necessity of coordinating the tank's role from individual tank to section and platoon? ANSWER: The tank commander must be a fighting member of the crew and not just a coordinator. The configuration of the vehicle will determine to what degree the commander will be involved in the actual weapons subsystem employment. The extent to which the commander acts as a fighting crew member, as opposed to being a coordinator, will also depend upon the status of his crew's training. Platoon leaders and platoon sergeants have a greater coordination role than do the remaining tank commanders in the platoon. This dual role has been adequately performed in tank units with four-man and larger crews. The armor leaders' participation in combat action should not be lessened in order to achieve a manpower savings or stowage space.

(4) What part, other than loading, does the loader play that makes him critical to the crew? ANSWER? The tasks performed by the loader are much greater than the name implies. The loader is responsible for the maintenance of the communication equipment, the main gun and secondary armament subsystems, ammunition, and the stowage within the fighting compartment. The loader assists other crew members in performing maintenance and provides close-in protection for the vehicle. He plays a very significant role in target acquisition and in early warning of air attack. His assignment to the vehicle permits an immediate replacement capability in the event of the incapacitation or loss of another crew member. His assignment permits flexibility in crew training and offers a cost-effective solution to crew fatigue on extended operations. The presence of the loader appears to preclude much of the additional support required by a smaller crew. A smaller crew requires additional people to perform security, mine detection, maintenance support, and resupply functions in order to sustain extended operations. These conditions cause the loader's position in the crew to be a critical one.

(5) To what degree is tank crew effectiveness reduced if crew members become incapacitated or seriously fatigued? ANSWER: HumRRO and University of Louisville studies indicate that crewmen who are required to conduct sustained combat operations for periods in excess of 48 hours suffer a decrease in combat effectiveness. The studies indicate that decreases in the efficiency of the crew are in direct proportion to the amount of sleep/rest lost during the period of operations. Since the studies were conducted under simulated combat conditions, the effects of actual combat upon the crew's alertness and efficiency were not measured. This loss of sleep/rest will cause the smaller crew to become ineffective earlier than the larger crew. This can be traced to two factors: a decrease in the amount of rest provided each man and an increase in the number of tasks to be performed by each man. The effectiveness of the crew and the vehicle in accomplishing its missions if one crew member is lost has also been taken into consideration in this evaluation. The loss of one man from the four-man crew should not seriously effect the accomplishment of the crew's mission. The remaining crew members can change positions and continue as a reasonably effective fighting crew. Should the three-man crew lose a man its effectiveness would be greatly reduced as position rotation would not be possible. A tank crew whose crewmen's effectiveness has been reduced by fatigue or stress cannot achieve a level of performance that is greater than that of the least effective crewman. Experience has shown that in evaluations of tank crews, individual performance shortcomings are multiplied when the crew is employed together. This relationship of interdependence between crewmen provides a situation wherein one highly effective member fails to achieve his true performance level when he must rely upon another crewman who is not performing at his maximum. For example, if all crewmen were performing at three-fourths effectiveness as individuals, the crew as a whole would be incapable of achieving that same three-fourths level due to crew interdependence. A four-man crew has an inherent capability of providing a controlled sleeping plan with mutual security. This capability allows the four-man and larger crews to resist the conditions which provide crew fatigue. A crew of less than four men will be seriously constrained in its efforts to maintain its effectiveness.

d. In determining the optimum crew size for sustained main battle tank operations, five courses of action were considered. In each course of action, the crew duties outlined in Figure 1 must be peformed, however, their allocation would be determined by vehicle configuration. For purposes of this evaluation, two crew members were considered to be absolutly necessary. An individual performing the duty of tank commander/gunner is essential for tank and tank crew command and control, coordination and communication with other tanks in the section and platoon, and weapons subsystem employment. A driver must be included in any system. Driving the vehicle allows few other duties to be performed simultaneously.

(1) Course of Action 1: A two-man tank crew consisting of crew members performing primary duties of driver and commander, with loader and gunner additional functions being allocated between them. The driver would perform the duty of driving primarily. Driving and assistance in target acquisition would require his full attention on the move. At the halt, he might assist the commander in adjusting fires, if a sight were made available at the driver's station. The commander would be required to coordinate the actions of his vehicle with others of the platoon. He would also fire the tank mounted weapons and operate the required automatic loader. This automatic loader would of necessity be very sophisticated, however, a manual back-up subsystem might also be required.

(a) Advantages:

1. Crew space requirements would be reduced by two men compared to the conventional four-man crew.

2. A manpower savings could be realized in comparison with the current organization.

3. More space would be available for ammunition storage, or the size of the vehicle could be reduced.

4. A two-crew concept could be adopted without personnel increases over the current organization.

(b) Disadvantages:

1. A two-man crew cannot effectively handle maintenance, resupply, security and target acquisition duties.

2. A more sophisticated vehicle would be required.

3. Increased maintenance support would be required for the more sophisticated vehicle.

4. Crew fatigue would rapidly develop to unacceptable levels during extended operations, unless a two-crew concept was employed.

5. The loss of one crew member would destroy vehicle effectiveness.

6. Even with a fully-operational two-man crew, the loader and gunner duties not performed by automatic components would have to be reallocated between the driver and commander.

7. Well trained replacements would have to be immediately available.

8. Crew would be limited to single weapon subsystem engagement.

9. The automatic loader restricts the number of rounds which can be pre-loaded and ammunition selection to the type of rounds remaining.

(2) Course of Action 2: A three-man crew consisting of a driver, commander, and gunner. As in course of action 1, an automatic loader would be required. The duties of the driver would be generally the same as discussed for the two-man crew. The tank commander and gunner would perform the duties outlined in figure 1. The duties of the loader would be required to be distributed among all three crew members.

(a) Advantages:

1. Crew space requirements would be reduced by one man compared to the conventional four-man crew.

2. A manpower savings could be realized in comparison with the current organization.

3. Depending upon the configuration of the automatic loader, more storage space might be made available.

4. Crew has the capability of dual weapon subsystem engagements.

(b) Disadvantages:

1. A more sophisticated vehicle would result.

2. A crew without a human loader has little ability to effectively perform many of the loader functions. For example, the loader function of acquiring targets would be reallocated to the gunner and commander. This reallocation would detract from other duties which the gunner and commander would already be performing. The most detracting of these would be the clearance of stoppages in the coax.

3. A crew which does not have a human loader has no "built-in" training and replacement capability. A loader in a four-man crew can be instructed in his duties in a relatively short time. While filling the position of the loader the crew member can be receiving instruction in the more complicated duties of gunner and driver's training. As configured, this three-man crew would require well-trained replacements for all positions of driver, gunner, or commander and perhaps even greater overall manpower than a larger crew.

4. Crew fatigue would develop more rapidly during extended operations than it would in a larger crew.

5. Increased maintenance support would be required due to the increased sophistication of the vehicle.

6. The three-man crew would be burdened to effectively handle maintenance, resupply, security, and target acquisition.

7. The automatic loader restricts the number of rounds which can be preloaded and ammunition selection to the type of rounds remaining.

(3) Course of Action 3: A three-man crew consisting of a driver, loader, and commander. Again, the driver's duties are essentially unchanged. The tank commander would command and control the vehicle and act as the gunner. The loader would load the main gun and coax. Gunner duties as outlined in figure 1 would be reallocated among the other three crew members.

(a) Advantages:

1. Crew space requirements would be reduced, thereby increasing ammunition stowage space.

2. A manpower savings would be realized in comparison with the current organization.

3. The initial fire command would be reduced to simply announcing the ammunition to be fired.

(b) Disadvantages:

1. Crew fatigue would develop more rapidly during extended operations than it would in a larger crew.

2. The majority of the gunner's duties would in all probability be reallocated to the vehicle commander, as the loader and the driver would be fully committed during a moving engagement. This reallocation would overburden the commander. As in course of action 2, this configuration will perhaps require even greater overall manpower than a larger crew.

3. Both loader and driver must be trained to assume the duties of commander with no on-the-job experience as gunner.

4. Crew is limited to single weapon subsystem engagement.

5. Increased maintenance support would be required due to the increased sophistication of the vehicle.

6. The three-man crew would be burdened to effectively handle maintenance, resupply, security, and target acquisition.

(4) Course of Action 4: A four-man crew consisting of a commander, gunner, loader, and driver. With this system, the four crew members concentrate on the functional areas as outlined in figure 1.

(a) Advantages:

1. Allows for a more appropriate distribution of required crew duties and functions than do the smaller crew configurations.

2. Cross-training allows a limited replacement capability if one man is lost.

3. The four-man crew has the capability of dual weapon subsystem engagement.

4. The performance of maintenance, resupply, security, and target acquisition duties is more effective than in the smaller crew and has been proven adequate with this crew configuration.

5. Fewer support maintenance personnel are required than by the smaller configurations since more maintenance can be performed by the larger crew.

6. Less subject to crew fatigue during extended periods of operation than the smaller crew.

7. No manpower increase over the current organization is required.

(b) Disadvantages:

1. The vehicle must be large enough to hold the crew, and therefore ammunition storage area would be sacrificed, particularly if an automatic loader was employed.

2. Does not provide on-board assignment of personnel to assist in the performance of security and maintenance.

3. No manpower savings realized in comparison with current organization.

(5) Course of Action 5: A five-man crew consisting of a commander, gunner, loader, driver, and a fifth man designated as either security guard, assistant driver, assistant loader, assistant gunner, automotive mechanic, turret mechanic, or other suitable job description.

(a) Advantages:

1. Allows greater flexibility in the assignment of crew duties and functions.

2. Cross-training provides an effective replacement capability.

3. The five-man crew has the capability of making dual weapon subsystem engagement.

4. The effective performance of maintenance, resupply, security, and target acquisition are more possible with the larger crew.

5. Vehicle and crew retain a high degree of effectiveness even with one man dismounted, incapacitated, or otherwise ineffective.

6. Less subject to crew fatigue than the smaller crews.

(b) Disadvantages:

1. A twenty-five percent increase in manpower over the current organization is required.

2. The larger crew requires a larger vehicle.

3. Ammunition storage area is sacrificed to obtain the volume required by the additional crew member.

4. The tank commander has a greater crew coordination task than he has with the smaller crews.

(5) Comparison of courses of action.

(a) General. The advantages of some courses of action are the disadvantages of others. The smaller crew configurations generally provide a manpower savings, a reduction in space requirements, and an increase in ammunition stowage capability. The larger crew configurations generally are more capable of accomplishing those crew functions necessary for extended operations, less subject to the effects of crew fatigue, and less subject to becoming ineffective if one member of the crew were to become injured, incapacitated, or seriously fatigued.

(b) C/A 1 and C/A 2 require an automatic loader resulting in a more sophisticated and difficult vehicle to maintain. C/A 1 and C/A 3 require a reallocation of gunner duties to the commander causing a serious degradation of his command and coordination functions. C/A 1 is considered to be incapable of sustained operations without the adoption of a two-crew concept. It also requires increases in support personnel to unacceptable levels. For these reasons, C/A 1 was eliminated. C/A 2 and C/A 3 appear burdened to accomplish the functions necessary for sustained operations. They are quite subject to becoming ineffective when one crew member is dismounted, or becomes incapacitated or fatigued. Their adoption produces a serious vulnerability on command vehicles which could result in an entire section or platoon becoming ineffective if any one of the members of those crews become incapacitated. For these reasons, C/A 2 and C/A 3 were also eliminated. C/A 4 provides no manpower savings but does allow a limited replacement and cross-training capability. It presents an alternative to the problem of crew fatigue experienced during extended operations. It appears to provide the smallest crew configuration which insures the accomplishment of the majority of the required crew duties and functions. It requires the least increases in vehicle size, weight, and sophistication. It requires the tank company be authorized a small organization for the accomplishment of security and maintenance related tasks. Such an element would require fewer personnel increases than C/A 5 while providing the unit commander with a comparable replacement capability. C/A 5 provides the best crew size for sustained operations since it can more easily accomplish all of the required additional duties of maintenance, resupply, security, and target acquisition and is the least subject to the effects of crew fatigue. It requires significant personnel increases and unacceptable vehicle size and weight increases. For these reasons, C/A 5 was eliminated.

(c) The optimum crew size for accomplishing all of the necessary crew duties and functions and particularly those necessary for sustaining extended operations lies somewhere between a four-man and a five-man crew. The four-man crew supplemented by a maintenance and security element consisting of ten men plus a supervisor at the company level appears as the more cost-effective solution. This alternative causes no vehicle size and weight increases since this element would not be transported in main battle tanks.

5. CONCLUSION: The four-man crew, supplemented at the company level by an organic maintenance and security element, offers the optimum crew size for sustained main battle tank operations.

6. ACTIONS RECOMMENDED:

a. That the conclusion in paragraph 5 be approved.

b. That the four-man crew be adopted for use in any future main battle tank design.

c. That an organic maintenance and security element consisting of ten men plus a supervisor be authorized in the tank company equipped with four-man tanks.

d. That the letter at Tab X be signed, forwarding this evaluation to the Director, Main Battle Tank Task Force.

Charles E. Canedy
CHARLES E. CANEDY
Colonel, Armor
Director

ANNEX A - List of References
ANNEX B - Tasking Letter
TAB X - Letter to Dir, MBT TF (Record Copy Only)

CONCURRENCES:

| | | | |
|---|---|---|---|
| C&S Dept: | Concur | Nonconcur_____ | Date 12 May 72 |
| Wpns Dept: | Concur | Nonconcur_____ | Date 12 May 72 |
| Autmv Dept: | Concur | Nonconcur_____ | Date 14 May 72 |

ACTION BY APPROVING AUTHORITY:

Approved X Disapproved _____ Date _____

GEORGE S. PATTON
Brigadier General, USA
Assistant Commandant

## LIST OF REFERENCES


Cook, J. G. and W. Warnick, The Tank Commander's Guide, Stackpole Co., Harrisburg, Pa., 1963.

Department of the Army, Field Manual 17-12, Tank Gunnery, 1964 w/Ch 1, April 1968.

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HumRRO Technical Report 47, The Determination of Job Requirements for Tank Crew Members, May 1958.

HumRRO Technical Report 69-8, The Effects of Sleep Deprivation on Performance Over a 48-Hour Period, May 1969.

University of Louisville Interim Technical Report 70-16, Effects of 48-Hours of Continuous Work and Sleep Loss on Sustained Performance, September 1970.

DEPARTMENT OF THE ARMY LTC Boudinot/cr/464-6437
HEADQUARTERS UNITED STATES ARMY
COMBAT DEVELOPMENTS COMMAND
MAIN BATTLE TANK TASK FORCE
FORT KNOX, KENTUCKY 40121

CDCMBTF-MN

24 MAR 1972

SUBJECT: Study Support of Main Battle Tank Development Program - Optimization of Crew Size

Assistant Commandant
US Army Armor School
ATTN: DDLP
Fort Knox, Kentucky 40121

1. References: a. Letter, DACS, dated 20 Jan 1972, subject: Main Battle Tank Development Program.

b. Letter, HQ USACDC, dated 2 Feb 1972, subject: Letter of Instruction for Main Battle Tank Task Force.

2. Request that the US Army Armor School evaluate crew duties and functions to determine the optimum crew size for sustained MBT operations. Crew size considerations should not be associated with specific tank designs but should develop rationale for crew stations in operation of the weapons system.

3. It is anticipated that the effort will be primarily a subjective analysis. Just how the necessary tasks of the tank crew be assigned to the various crew members is a constant question. The size of the crew effects the required tasks and possibly the overall operational capabilities of the tank.

4. There are several basic problem areas in the allocation of crew tasks that are of considerable importance in the initial design phase of the MBT and might determine the crew size.

a. The role of the commander in each of the varied missions that may be assigned to the tanks.

b. How will this role impact if another crew member is injured (loader must replace driver)?

c. To what extent should the commander be a fighting member of the crew compared with the necessity of coordinating the tank's role from individual tank to section and platoon?

CDCMBT-MH
SUBJECT: Study Support of Main Battle Tank Development Program - Optimization of Crew Size

d. What part does the loader play that makes him critical to the crew other than loading?

5. Particular emphasis should be placed on tank crew effectiveness over several levels if crew is incapacitated and seriously fatigued.

6. The completed evaluation of this task must be received in the MBT Task Force NLT 15 May 1972. Due to time limitations, maximum use of data from recent or on-going studies should be considered.

7. The Main Battle Tank Task Force point of contact for this effort is LTC Burton S. Boudinot, AUTOVON 464-6437.

WILLIAM R. DESOBRY
MG, USA
Director

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